ON SOME NEW FORMS OF BATRACHIA FROM S. INDIA.

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The material which forms the subject of this paper has been collected during the excursions of the members of the Staff and students of the Department of Zoology, University of Mysore, for over six years. The primary object of these excursions has been to study the distribution of anuran fauna in the localities explored, their mode of occurrence and their general habits. We selected certain types of areas marked by distinctive physical features, and the results of our collections and of the field observations are set forth in these notes.

The Malnad areas of Kadur, Hassan and Shimoga Districts of Mysore, the Anamalai Hills of Coimbatore and Perambikulam forests of Cochin were selected for making collections, and for purposes of comparison, specimens were also taken from the plains. The chain of hills separating Mysore from Malabar and North and South Canara forms a definite landmark and well-wooded gigantic spurs, divided by innumerable water courses, extend on either side. The base of these elevated regions is clothed with dense vegetation and harbours pools formed by waterfalls. The soil is composed almost entirely of laterite, and there are places in the Malnad where rich loam and stiff clay are also encountered. During the monsoon these areas receive abundance of rain which inundates the country swelling the small mountain streams into torrents and converting the shallow puddles into dangerous pools. Perambikulam is in the heart of Cochin forests and the summit of the hills are covered by grass, being elevated above the forest belt. Below the hills are covered by bamboos and forest trees which abound in big game. Anamalai Hills are clothed by impenetrable forests and even the base of the Hills could only be approached with difficulty. On account of scanty rainfall in the lower regions, the ground is hard and water scarce. During the hot weather all these areas become parched and they seem scarcely to harbour any life. The most favourable time for collection of batrachian specimens is sometime after the rains, when cryptozoic forms will not have retreated into their burrows, but will be found lurking near about the water margins.

The distribution and occurrence of batrachian fauna in the Maidan, semi-Malnad areas and the ghats which present striking physical features, present a sharp contrast. The main point of interest is that each of these

areas is inhabited by groups which hardly extend into the adjacent territory. For instance, typical Maidan forms like *R. hexadactyla, R. tigrina, R. limnocharis* and *R. breviceps* are not encountered in the ghats and the only exception is *R. cyanophlyctis* which can be taken in the thickest forest and on the tops of the highest peaks. *Bufo melanostictus* follows *R. cyanophlyctis* in its occurrence; but *Bufo fergusoni* does not extend beyond the semi-Malnad area into the ghats. Again *Rhacophorus maculatus* is strictly an inhabitant of the plains and is rarely met with in the ghats, though a few specimens of this species have been collected from the semi-Malnad areas. We can scarcely draw a line of demarcation between strictly Malnad and semi-Malnad in regard to the distribution of forms such as *Rana curtipes, Rana malabarica, R. leptodactyla, R. aurantiaca, R. dobsoni, R. verrucosa, R. rufescens, R. beddomii* and similarly with regard to *Rhacophorus malabaricus, Rh. lateralis* and *Bufo pulcher, Bufo microtympanum, B. parietalis*. When we enter the forests which clothe the sides of the hills, we discover that these forms are replaced by a bewildering wealth of batrachian life belonging to the genera *Ixalus* (*Philautus*) and *Micrixalus* and *Nyctibatrachus*, and *R. cyanophlyctis* and *Bufo melanostictus*, however, freely mingling with them. Except for a few stray forms of *Ixalus* and *Micrixalus* occasionally found in the semi-Malnad areas, the three genera *Ixalus* and *Micrixalus* and *Nyctibatrachus* may be described as inhabitants of mountain slopes, but they rarely extend to the summits where only *R. cyanophlyctis* and *Bufo melanostictus* occur.

Among the *Engystomatidæ*, the most hardy creature is *Microhyla ornata*, which in point of distribution follows *R. cyanophlyctis* and *Bufo melanostictus*, though it may not be found on the summit of the hills. *Cacopus* (*Euperodon*) *systoma, M. rubra, Callula* (*Ramanella*) *variegata, C.* (*R.*) *triangularis* and *C.* (*R.*) *obscura* are strictly confined to the plains. But the semi-Malnad zone in Mysore harbours a race of *Callula* (*Ramanella*) whose adaptive modifications to the peculiarities of the environment affected by them, differ so strikingly from their congeners in the plains, that one would be justified in creating a separate genus for the reception of these forms. They are all as a rule short legged, the tibio-tarsal articulation hardly extending beyond the middle of the body, and they have no web, and all possess the power of climbing the smooth surfaces of the plantain trees. Our collection of Engystomatid forms from the plain districts is sufficiently rich and varied and a comparison of the semi-Malnad specimens with them indicates the lines along which divergence has proceeded. It is to be noted that none of these Engystomatidæ are met with in the thickly wooded places on the slopes of hills, and their favourite haunt is the cordamom plantation and plantain gardens behind the village houses of the Malnad areas.

The hill slopes which receive an annual rainfall of over 200 inches, are cut up by mountain torrents during the monsoon, but become dry and parched during the hot weather. The Batrachians [*Ixalus* (*Philautus*), *Micrixalus* and a few members of *Rhacophorus* and *Nyctibatrachus*] affecting these slopes, are scarcely met with in water, but are always found clinging to the rocks, loose stones and tree trunks in the close vicinity of waterfalls, running brooks and sheltered pools. They have large digital expansions, and excessively long hind limbs and slender bodies (the only exception being *Nyctibatrachus*), enabling them to cling to hard surfaces when their homes are flooded, or to swim against the rapid current. *R. cyanophlyctis* is a thoroughly aquatic form, but it has a habit of burrowing in sands under water and also of skimming over the surfaces of water by taking a series of short leaps, enabling the frog to escape being carried away by the floods. *B. melanostictus* is capable of burrowing or entering narrow crevices and fissures of rocks, where they abide till the disturbances of weather are over. In consequence of these peculiar habits of life, they do not seem to have developed any anatomical peculiarities different from the other members of their tribe living in the plains. Both these forms are known to traverse fairly long distances and it is this habit which has brought them to the Malnad areas and hill tracts.

The larvæ of some species of *Ixalus* in our collection almost as a rule have greatly enlarged lips, which, we have noticed, they use in adhering to rocks and water weeds. They are sufficiently large to act as floats in case the tadpoles are caught in the rapids. It is well known that the tadpoles of *Nyctibatrachus* possess widely expanded lips which are suctorial. In the case of *R. cyanophlyctis* and *Bufo melanostictus*, the tadpoles have powerful caudal fins, far more powerfully developed than in the forms found in the plains and their pouting lips are provided with enlarged beaks and teeth. As a rule, they attain a larger size, far larger than tadpoles of corresponding age in the plains. In the semi Malnad belt, where a large number of species of *Rana Rhacophorus* and *Bufo* occur, their larvæ differ in the degree of development of fin, size of tail and in the mouth parts, which, while affording diagnostic characters, are nevertheless features due mainly to adaptive modifications. I have had occasion to study the larval forms of anura taken from all these areas, and I am of opinion that, while those coming from similar situations present fairly uniform characteristics capable of being used for taxonomic purposes, on the other hand, specimens of tadpoles belonging to the same species, but taken from situations differing widely in regard to the condition of the country and rainfall, show corresponding differences in external morphology. I shall refer below to a few instances of such divergent modifications and point out how the mouth parts alone, such as the beaks

and horny denticles, are not affected by the change of environment and how they can be used for the purpose of relating the tadpoles to their parents on the basis of these characteristics. Appropriate comments on the tadpoles will be made under the respective heads.

In the descriptive part, I have followed the nomenclature introduced by Parker, Boulenger and Malcolm Smith.

Recently, a number of emended schemes of classification of the group *Anura* have been put forward, based upon osteological characters. The family engystomatidæ under the changed nomenclature is treated as Microhylidæ by H. W. Parker[1] and the names of the Indian genera formerly included in the group have also undergone alteration. Thus Cacopus becomes *Uperodon—Callula* is now recognised as *Ramanella,* while *Microhyla* and *Melanobatrachus* are permitted to retain their names unaffected. In S. India, the family Microhylidæ is chiefly represensed by the following four genera : (1) *Uperodon,* (2) *Ramanella,* (3) *Microhyla* and (4) *Melanobatrachus.* As the first two names are not quite familiar yet and as it is not widely understood what they replace, I have used the names still in common use in the introduction and in the systematic description, I have adopted the new nomenclature. Similarly with regard to *Ixalus.*

In 1920, Boulenger[2] revised the genus *Rana,* making use of several characters neglected for a long time and he pointed out that the recognition of their value for taxonomic purposes might lead to a better understanding of their inter-relationships. He has divided the genus *Rana* into 9 sub-genera of which species belonging to sub-genera *Rana, Tomopterna, Discodeles* and *Hylorana* are represented in South India.

In 1930, Dr. Maclolm Smith[3] pointed out that, as the name *Ixalus* was preoccupied, this genus should in accordance with the accepted terms of nomenclature be known as *Philautus* and he does not favour the fusion of this genus with *Rhacophorus* whose generic position is still left intact. He retains the name *Rhacophorus* in preference to *Polypedates.*

In the following descriptive accounts, I have used the names suggested by these authors.

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[1] "Frogs of the Family Microhylidæ," H. W. Parker, B.A., *British Mus. Nat. Hist.,* 1934.

[2] "A Monograph of the South Asian, Papuan, Melanesian and Australian Frogs of the Genus *Rana,*" G. A. Boulenger, *Rec. Ind. Mus.,* Vol. XX, June 1920.

[3] "The Reptilia and Amphibia of Malaya Peninsula," Malcolm A. Smith, *Bull. Raffles Museum, Singapore,* 1930.

Genus RANA.

Sub-Genus TOMOPTERNA.

Rana parambikulamana n. sp.

Vomerine teeth in short oblique series, commencing from the inner angle of the choanæ which are transverse, oval and directed inwards. The hinder margin of the vomerine teeth, extending far beyond the posterior border of the choanæ. Tongue without a median papillæ. The lower jaw with three tooth-like conical prominences.

Head convex, distinctly longer than broad; snout pointed, projecting beyond the lower jaw, longer than the eye; canthus rostralis obtuse; loreal region slightly oblique, concave; nostril nearer to eye than to the tip of the snout; distance between the nostrils greater than the interorbital width which is 2/3 that of the upper eye-lid; tympanum indistinct, 2/5 the diameter of the eye, equal to its distance from the eye.

Fingers rather short, obtuse, first nearly equal to the 2nd, both considerably shorter than the third which is distinctly longer than the snout. The first finger with a larger basal pad; subarticular tubercles prominent, rounded; fourth digit equals the diameter of the eye.

Hind limb long, the tibio-tarsal articulation reaching far beyond the tip of the snout; the heels crossing when the limbs are folded at right angles to the body; tibia more than three times as long as broad and 2 and 1/6 times in the length from snout to vent, slightly longer than the fore limb and longer than tarsus; fourth toe considerably longer than the thigh or tibia and slightly more than twice the length of the tarsus. All the toes are long, obtuse, $\frac{1}{4}$ webbed, outer metatarsals united, subarticular tubercles small, not conspicuous; inner metatarsal tubercle large smaller than the first toe, inserted almost in line with the latter; outer metatarsal tubercle inconspicuous.

Skin smooth above and on the ventral surface; a fold from the hinder angle of the eye, extending over the tympanum to the shoulder; two short prominent folds from behind the eye directed slightly inwards; and a pair of less conspicuous folds on either side of the dorsal band, also starting from the upper margin of the eyelids; two short obliquely set folds forming an open ∩-shaped space on the back behind the shoulder as in *R. verrucosa* and *R. rufescens*. No granulation on any part of the body.

Yellowish brown above, deeper over the head and the shoulder, with a light vertebral band; cutaneous folds edged black; a broad white band from the eye to shoulder beneath the fold; lips with alternate light and dark bands; sides of body and ventral surface white; limbs barred, the stripes of the thighs oblique.

Male with two large vocal sacs, black confluent medially.

A single specimen. Type in the Central College Museum.

Habitat.—Parambikulam forests, Cochin State, S. India.

MEASUREMENTS.

	mm.		mm.
From snout to vent	39·00	Fore arm	8·00
Head	15·00	Arm	9·00
Width of head	11·50	First finger	6·00
Snout	6·50	Second finger	5·75
Eye	5·00	Third finger	2·50
Upper eyelid	3·00	Fourth finger	5·00
Interorbital width	2·00	Thigh	16·50
Distance between eye and nostril	2·50	Width of thigh	8·00
		Tibia	18·00
Distance between nostril and tip of snout	3·00	Width of tibia	5·00
		First toe	5·00
Distance between nostrils	3·00	Second toe	9·00
Distance between eye and tympanum	2·00	Third toe	15·50
		Fourth toe	23·50
Tympanum	2·00	Fifth toe	14·00
Internarial distance	3·00	Inner metatarsal tubercle	3·00

I have compared this specimen with R. *rufescens*, *R. breviceps* and *R. dobsoni*, from which it differs almost in every character, and generally resembles *R. tigrina* in external form, though differing in details both from this species and *R. limnocharis* (Forma typica) through which this new species is derivable.

Rana leucorhynchus, n. sp.

Vomerine teeth in strong oblique series, separated only by a narrow median gap in the median line, but well separated from the choana. The choana are oval orifices, transversely situated. Behind the vomerine teeth, a well-marked broad triangular palatine cavity. Tongue without a median papillæ; lower jaw with a single tooth-like prominence.

Head narrowly concave, slightly longer than broad; snout obtuse, truncated, projecting beyond the mouth, very slightly longer than the eye; canthus rostralis angular; loreal region oblique, broadly concave; nostril slightly nearer the tip of the snout than the eye; distance between the nostrils equals the inter-orbital width; upper eye lid $\frac{3}{4}$ in the distance between the eyes; tympanum distinct, smaller than the diameter of the eye, $3\frac{1}{2}$ times its distance from the latter.

Fingers rather long, pointed, first longer than the second, shorter than the third which is longer than the snout; the first exactly equals the snout and twice the width of the upper eyelid. Subarticular tubercles large and conical; tubercular pads at the base of the first and third finger.

Hind limbs short, the tibio-tarsal articulation reaching the eye, the heel separated when the limbs are folded at right angles to the body; tibia just as long as the thigh; length of tibia more than 3 times in the length of thigh, more than 2 times in its length; width of thigh equals the length of the snout and the latter $1\frac{1}{2}$ times the width of tibia. The length of the hind limb (without digits) exceeds very slightly the distance between the snout and vent. Tarsus two times the width of tibia; toes rather short, $\frac{1}{3}$ webbed, outer metatarsals united; subarticular tubercles small, inconspicuous; an inner tarsal fold present, inner metatarsal tubercle large, strongly, compressed with a sharp edge, as long as the first toe, at the base of which it is obliquely set. A small outer metatarsal tubercle at the base of the fourth toe.

Dorsal surface of the body, throat and chest smooth; abdomen and sides of the body and lower surface and posterior margin of thighs granular; sides of body with interrupted folds; no fold from eye to the shoulder.

Pale brown above; upper surface of snout including the anterior third of the upper eyelid with a distinct broad white band. Between the eyes a dark W-shaped band; behind the eyes and shoulders white; proceeding from behind the eyes, a long oval brown mark with a pair of darker streaks running along the median line of the area. A similar mark ∩-shaped in the median line of the back, and ∪-shaped marks on the sides of the body and hip; fore arms and legs cross barred; throat and abdomen white; under-surface of thighs yellow; loreal region with a dark broad band from the eye to the snout; below the eye a dark anvil-like mark, the lower lid being white; foot chocolate brown.

MEASUREMENTS.

	mm.		mm.
Snout to vent	35·00	Arm	7·00
Head	16·50	First finger	6·00
Width of head	15·00	Second finger	5·00
Snout	6·00	Third finger	7·50
Eye	5·50	Fourth finger	4·75
Distance between eye and nostril	2·50	Thigh	13·50
		Tibia	13·50
Distance between nostril and snout	3·00	Tarsus	8·00
		Width of thigh	6·00
Distance between nostrils ..	4·00	Width of tibia	4·00

	mm.		mm.
Distance between eye and tympanum	1·00	Inner metatarsal tubercle ..	3·50
Interorbital width ..	4·00	First toe	3·50
Upper eyelid	3·00	Second toe	6·00
Tympanum	3·50	Third toe	10·00
Fore arm	7·25	Fourth toe	14·00
		Fifth toe	8·50

Toes $\frac{1}{3}$ webbed

(Linked with *Rana tigrina* through var. *pantherina* resembling *R. cancrivora* at least superficially.)

Habitat.—Wattakole, Coorg, South India.

A single specimen.

Type.—Central College, Bangalore.

Sub-Genus HYLORANA.

Rana intermedius, n. sp.

Vomerine teeth in short oblique groups, arising far from choana, the distance between them and the latter is greater than the median gap separating the series of teeth. The internal bulging of the eyes into the mouth forms two large massive structures almost meeting in the median line posterior to the vomerine teeth. Tongue very large and broad, without a papillæ.

Head strongly depressed, much longer than its width; snout acutely pointed, projecting well beyond the mouth, far longer than the diameter of the eye; canthus rostralis very distinct, loreal region nearly horizontal, deeply concave; nostril nearer to the tip of the snout than the eye; distance between the nostrils equal to the interorbital width; upper eyelid four-fifths in the distance between the eyes; tympanum (that on the right side is larger than the left) very distinct; smaller than the eye, separated from the latter by a distance equal to $\frac{1}{4}$ or $\frac{1}{5}$ its own diameter.

Fingers rather slender, terminating in discs; first longer than the second; third slightly longer than the snout; subarticular tubercles fairly large, round; a distinct horse-shoe shapped groove separating the upper half of the disc from the lower.

Hind limb rather long; tibio-tarsal articulation reaching the nostrils, heels completely overlapping when the legs are folded at right angles to the body; tibia nearly five times as long as broad and more than half the total length of the body, very greatly exceeding the fore limb; toes moderately

long, the tips dilated into discs, all bearing more or less well defined grooves ; discs broader than long ; web extending to the tips of all the toes except the fourth and fifth ; subarticular tubercles conical, not conspicuous ; outer metatarsal tubercle 2/5 in the length of the first toe ; a small conical outer metatarsal tubercle at the base of the fourth toe.

Skin smooth ; a narrow dorso-lateral glandular fold from the eye to the groin ; no fold from the eye to the tympanum to the shoulder ; the distance between the dorso-lateral folds across the iliac bones is more than 1/5 in the total length of the body ; humeral gland. No parotoids.

Uniform brown above ; sides darker ; limbs faintly cross-barred ; abdomen and throat with irregular dark areas ; under surface of thighs yellowish ; posterior and anterior border of the thighs mottled.

Habitat.—Saklespur, Hassan District, Mysore State.

Type.—Central College, Bangalore.

The species is intermediate between *R. gracilis* and *R. temporalis*, both of which occur in the same locality with *R. malabarica*, *R. aurantiaca* and *R. curtipes*. I have compared this with these members in almost every particular and I am convinced that though it resembles with one or the other of these species in certain characters, it is entitled to the rank of a separate species. This course is justifiable when the size and proportions of the head, the relative size of the tympanum and the eye are taken into account.

MEASUREMENTS.

	mm.		mm.
Snout to vent	43·00	First finger	7·00
Head	20·00	Second finger	6·00
Width of head	13·50	Third finger	9·00
Snout	8·50	Fourth finger	7·50
From nostril to tip of snout	4·00	Thigh	20·00
Tympanum	4·00	Width of thigh	5·00
Eye	6·50	Inner metatarsal tubercle ..	2·00
From eye to nostril ..	4·75	Tarsus	12·00
Internarial width ..	5·00	Width of tarsus	3·00
Interorbital width ..	5·00	First toe	5·00
Upper eyelid	4·00	Second toe	8·50
Distance between tympanum and eye	1·00	Third toe	13·50
		Fourth toe	20·00
Arm	9·00	Fifth toe	15·00
Fore arm	8·25		

Rana sauriceps, n. sp.

Vomerine teeth in short oblique series, arising from the anterior border of the choanæ which are horizontal and extending slightly beyond the hinder border of the latter. Lower jaw with a small median and two lateral median tooth-like prominences. Tongue very small, without a papilla.

Head somewhat elongated, convex, longer than broad; snout acutely pointed, truncated projecting beyond the mouth, twice as long as the diameter of the eye, with a triangular or diamond-shaped pit on the terminal dorsal aspect. Behind this rostral pit there are two oval elevations with a median transverse groove and both separated from a similar elevation between the eyes. These elevations look not unlike the cephalic shields of the Saurians; behind the tip of the snout there is a pit on each side, separated by a ventral bar from the loreal region which is almost horizontal and concave; canthus rostralis obtuse; nostrils nearer to the snout than to the eye; distance between the nostrils equal to the interorbital width; tympanum slightly smaller than the eye, the latter is twice the distance between it and the former and this distance is equal to the upper eyelid.

Fingers moderate, obtuse without discs; first finger equal to the second, about $\frac{2}{3}$ in the length of the snout; third as long as the snout; the fourth longer than the first or second and is equal to the arm. Subarticular tubercles conical, moderate.

Hind limbs rather long, slender, tibio-tarsal articulation reaching the nostril; heels very slightly overlapping when the legs are folded at right angles to the axis of the body; thigh nearly twice its width; tibia three times its width, but considerably less than half the total length of the body and slightly shorter than the third toe equal to the fifth; toes pointed; web not extending to the tip of the first phalangeal bone, rather stopping at the base; outer metatarsals not united, separated by web, inner metatarsal tubercle about $\frac{1}{2}$ the diameter of the eye; a small rounded outer metatarsal tubercle at the base of the fourth toe; subarticular tubercles small, inconspicuous.

Upper surface of the skin slightly granulate, with short interrupted longitudinal folds with a few tubercles; curved temporal fold is present; in preserved specimens, the abdomen is thrown into fine transverse folds; throat, abdomen and undersurface of the thighs free from granulation. No dorso-lateral glandular fold. A ∩-shaped mark found on the back behind the shoulders.

Above chocolate red, sides darker, fore arm and tarsus faintly barred; throat and chest yellowish, abdomen brown, the under surface of the thighs

pale orange ; upper lip with vertical bands, two of which enter the eye ; the lower lip with dark and white spots or bars.

MEASUREMENTS.

	mm.		mm.
Snout to vent	30·00	Third finger	6·00
Tympanum	2·50	Fourth finger	5·00
Eye	3·00	Thigh	10·50
Distance between eye and tympanum	1·50	Width of thigh	5·00
		Tibia	12·00
Head	10·50	Width of tibia	4·00
Width of head	8·75	Tarsus	9·00
Snout	6·00	Width of tarsus	3·00
From nostril to snout ..	2·25	Inner metatarsal tubercle..	1·50
From eye to nostril ..	3·00	First toe	4·00
Interorbital width ..	3·75	Second toe	8·00
Upper eyelid	1·50	Third toe	11·00
Fore arm	6·50	Fourth toe	15·00
Arm	5·00	Fifth toe	10·00
First finger	4·00	Outer metatarsal tubercle ..	0·75
Second finger	4·00		

Habitat.—Wattekole, Coorg, S. India.

A number of specimens of all ages.

Type.—Central College, Bangalore.

Sub-Genus DISCODELES.

Rana tenuilingua n. sp.

Vomerine teeth in short, transverse or slightly oblique series, arising separately from the choanæ, almost on a level with the posterior border of the latter ; the space between the rows exceeds the distance between the teeth and the choanæ ; tongue very thin, small, the posterior notch sometimes very broad, a small conical retractile papilla in the middle ; the lower jaw is covered by the upper throughout and the maxillary teeth are large, without tooth-like prominence on the lower jaw.

Head broadly convex, slightly wider than long ; snout obtuse projecting beyond the mouth, as long as or slightly longer than the eye ; canthus rostralis obtuse ; loreal region oblique concave ; nostril nearer to the tip of the snout than the eye ; interorbital width more than twice the distance between the nostrils and is equal to the upper eyelid ; tympanum $\frac{2}{3}$ in the diameter of the eye and twice the distance between it and the latter ; the fronto-parietal region is excavated into a flask-like depression, occasionally traversed by a median groove and this area is further separated by a transverse groove from the nasal region where the fold of skin is elevated into scale-like patches

separated by a median groove corresponding with the bony sutures. The nasal "scales" are divided from the premaxillary area by a transverse groove, with a ridge of skin in front, connecting the nostrils. The markings on the head are exactly like those of *Rana sauriceps* but without the rostral pit.

Fingers are short, tips dilated into truncated discs which are broader than long ; the groove in front of the discs is either absent or faintly marked in some ; first finger as long as or very slightly longer than the second ; third slightly longer than the snout ; subarticular tubercles very faintly visisble.

Hind limb long, tibio-tarsal articulation reaching nostril or tip of snout, the heels strongly overlap when the limbs are folded at right angles to the body ; tibia about 5 times as long as broad ; thigh half in the length of the body from snout to vent and longer than the fore limb ; toes rather short, discs truncated, broader than long, the groove indistinct ; web extending to nearly three-fourths of the first phalanx of fourth toe and second of fifth and third ; web not extending to the base of the outer metatarsals ; subarticular tubercles inconspicuous ; inner metatarsal tubercle feebly developed, a very small outer metatarsal tubercle at the base of the fourth toe. Phalanges T-shaped.

Upper surface of skin with a series of interrupted fine folds, about 6 to 7 longitudinal series can be made out ; throat and chest and undersurface of thighs smooth, abdomen finely granulate. No temporal fold.

Pale brown above ; sides darker ; upper surface of snout white ; a dark band from the tip of the snout extending through the loreal region, and below the eyes, surrounds the tympanum ; a short dark band from the tympanum to the shoulder ; lower jaw with dark and white longitudinal bars ; fore arm and fingers and hind limbs barred ; throat pale yellow ; abdomen white, undersurface of thighs reddish.

MEASUREMENTS.

	mm.		mm.
From snout to vent	23·00	First finger	2·25
Tympanum	2·00	Second finger	2·00
Eye	3·00	Third finger	4·00
Distance between tympanum and eye	1·00	Fourth finger	2·50
Snout	3·50	Thigh	11·00
Distance between eye and nostril	2·25	Width of thigh	3·50
Distance between nostril and snout	1·25	Tibia	13·50
Distance between nostrils ..	2·75	Width of tibia	2·50
Distance between eyes ..	3·00	Tarsus	7·50
Upper eyelid	1·25	Width of tarsus	1·50
		Inner metatarsal tubercle ..	1·00
		First toe	2·50
		Second toe	5·00

	mm.		mm.
Head	9·00	Third toe	7·50
Width of head	9·25	Fourth toe	12·0
Fore limb : Arm	4·75	Fifth toe	7·00
Fore arm	4·75	Outer metatarsal tubercle ..	

Habitat.—Kemphole Ghats, Hassan, Mysore, South India.

Type.—Central College, Bangalore.

Genus NYCTIBATRACHUS.

Nyctibatrachus sylvaticus, n. sp.

Vomerine teeth in two oblique rows, short series set well behind the choanæ.

Head as long as broad or slightly longer, depressed, projecting beyond the mouth. Snout not longer than the diameter of the eye. Inter-orbital space equals the width of the upper eyelid. Eyes lateral. Distance between the eye and the nostril equals $2\frac{1}{2}$ times the internarial width. Tympanum partially or completely hidden. Supra tympanic fold present. Habit not stout. Canthus rostralis angular, well marked. Loreal region concave, oblique. Fingers dilated into small discs. First finger shorter than second. Third longer than snout. Subarticular tubercules moderately large, not very prominent.

Hind limbs long. The tibio-tarsal articulation reaching the posterior angle of the eye. Heels touch when the limbs are folded at right angles to the body. Thigh more than $1\frac{1}{2}$ times longer than its width and tibia more than three times its width, and less than half in the length of the body. Toes with tips swollen into small discs, more than half-webbed. Sub-articular tubercles moderately developed. Inner metatarsal tubercle elongate, spade-like, more than half the length of the first-toe, connected by web to the base of the first toe. No outer metatarsal tubercle.

Skin above with tubercles and short glandular folds. Thighs free. Tibia, tarsus and fifth toe distinctly granular. Arms feebly granular. Lower surface including the limbs perfectly smooth.

Brown above. Both limbs with faint cross bars. Ventral surface including the limbs whitish. Lower jaw with feeble white bars on a pale background of brown.

MEASUREMENTS.

	mm.		mm.
Diameter of the eye ..	4·00	Fourth finger	6·75
Snout	6·00	Thigh	17·75
Interorbital space ..	4·00	Thigh thickness	10·00
Upper eyelid	4·00	Shank	19·00

	mm.		mm.
Internarial width ..	2·00	Shank thickness	6·50
Distance between eye and nostril	5·00	Tarsus	11·00
Arm	6·75	Tarsus thickness	3·50
Arm thickness	3·50	First toe	5·00
Fore arm	8·75	Second toe	8·00
Fore arm thickness ..	4·00	Third toe	12·00
First finger	5·00	Fourth toe	17·00
Second finger	6·00	Fifth toe	12·00
Third finger	8·00	Inner metatarsal tubercle ..	2·75
		Total length	42·00

Habitat.—Forests of Kempholey, Saklespur, Hassan, Mysore.

Type.—Central College, Bangalore.

Remarks.—There are three species of *Nyctibatrachus* known, *viz.*, *N. pygamæus*, *N. major* and *N. sanctipalustris*, of which we have a fairly good collection. The new species differs from the known forms in certain fundamental respects and might even appear as a connecting link with *Rana*. For instance, the tympanum is only partially hidden, the eyes are laterally directed and the body is not stout and a canthus rostralis is present. With the exception of these characteristics, its resemblance to the other species of *Nyctibatrachus* is fairly intimate. The configuration of the body and limbs of this species may perhaps be an expression of convergence towards the *Ixalus* type, evoked by the peculiar mode of life and the character of the surroundings.

Genus NANNOBATRACHUS.

According to Boulenger this genus is distinguished from *Nannophrys* by the character of the pupil which is vertical in *Nannobatrachus* and horizontal in *Nannophrys*. To this difference he adds a few other factors which make the two genera sufficiently distinctive. The species with which the following notes deal, possesses a horizontal pupil more or less red even in the preserved state and agrees with the other characteristics of *Nannobatrachus*. The pupil of the eye in the living specimen bears no resemblance to its shape in the preserved forms, undergoing some amount of distortion on account of contraction. This is rather an uncertain character for the purpose of differentiating genera, and even as a specific character it is not reliable. No importance is attached to this character in these notes. I have not examined *Nannophrys* and am therefore unable to suggest how far we may depend upon characters like the outer metatarsals being united at the base or separated by grooves for separating *Nannophrys* from *Nannobatrachus*. Boulenger has described only two species of the former and one of

the latter and for purposes of the example described below, I shall adopt his classification.

Nannobatrachus kempholeyensis, n. sp.

Pupil red, horizontal, habit fairly stout, toad-like. Vomerine teeth in two short series almost transverse arising from the anterior border of the choanæ, with a wide gap between, which is nearly twice as wide as the series of the teeth. Tongue moderate, nicked deeply behind, bearing in front a large spherical elevation, clearly marked off from the rest of the tongue and surrounded by a pit: whether a retractile papilla is present is doubtful. Lower jaw without a tooth-like projection.

Head flat, wider than longer; snout rounded, scarcely projecting beyond the mouth, as long as the interorbital width or twice the diameter of the eye; canthus rostralis indistinct, loreal region either nearly vertical or slightly oblique, concave in the latter case; nostril equidistant between the eye and the tip of the snout; distance between the nostrils $\frac{2}{3}$ in the interorbital width; upper eyelid equal to the distance between the nostrils or the diameter of the eye; tympanum indistinct or absent.

Fingers rather small, first obtuse; second, third and fourth with ends dilated at the tips into spherical balls not very distinct from the ultimate phalangeal bone; first finger slightly smaller than the second; subarticular tubercles distinct on the third and the fourth fingers only.

Hind limb short, the tibio-tarsal articulation not reaching quite the eye but only its posterior border; the heels do not meet when the limbs are folded at right angles to the body; thigh as long as the fourth toe and less than twice its own length; tibia more than twice the length of the snout and slightly exceeds the width of the head; tarsus quite as long as the thigh and more than twice its own width; tips of toes dilated into small discs, not distinct on the first, discs as long as broad; second toe very slightly exceeds the length of the first; subarticular tubercles indistinct; inner metatarsal tubercle very minute and the outer at the base of the fourth toe still more minute; no rudiment of web. No tarsal fold. Outer metatarsals separated by grooves.

Skin smooth or slightly granulate behind the eyes and shoulders; no folds on the back or sides in the living forms (preserved specimens show them on the sides due to shrinkage); a short temporal fold only occasionally present on one side and in that case extending beyond the shoulder. Abdomen and lower surface of thighs finely granulate.

Upper parts of the body and limbs deep bronze or black uniformly; in the males throat is yellowish; in the females the throat and abdomen and undersurface of thighs very finely marbled; hand white; foot darker; the red eyes in the living forms are very bright and conspicuous.

Males with internal vocal sacs united into a comparatively large structure extending to the breast.

Omosternum and sternum cartilaginous and slender terminal phalangeal bones of toes slightly expanded; nasal bones relatively wide, separated from one another and from the fronto-parietals by narrow grooves.

MEASUREMENTS.

	mm.		mm.
Snout to vent	18·00	First finger	1·50
Head	6·00	Second finger	2·00
Width of head	7·00	Third finger	3·50
Snout	3·00	Fourth finger	3·00
Distance between nostrils		Thigh	5·00
and tip of snout ..	1·50	Tibia	7·75
Distance between eye and		Width of thigh	3·00
tip of snout	1·50	Width of tibia	2·00
Internasal width ..	2·00	Tarsus	5·00
Interorbital width ..	3·00	Width of tarsus	2·00
Tympanum		First toe	1·50
Eye	2·00	Second toe	1·75
Upper eyelid	2·00	Third toe	3·00
Fore limb : Fore arm ..	4·50	Fourth toe	5·00
Arm	3·00	Fifth toe	4·00

Habitat.—Hills of Kempholey Ghats, Hassan, Mysore, S. India. Four specimens.

Type.—Central College, Bangalore.

The frogs were found under the rocks near waterfalls and they are incapable of burrowing. Nothing is known about their breeding habits.

This species may be distinguished from *N. beddomii* thus :—

1. Tibio-tarsal articulation reaching the tip of the snout or not quite so far; limbs barred; white below immaculate, tongue without an elevated button-like structure in front .. .. *N. beddomii.*
2. Tibio-tarsal not reaching the eye, limbs without bars; beneath finely marbled; tongue with a button-like structure in front .. *N. kempholeyensis.*

Genus BUFO.

Bufo brevirostris, n. sp.

Crown without bony ridges. Habit stout. Head perfectly flat, broader than long; snout rounded, not projecting beyond the mouth, as long as the eye; canthus rostralis angular; loreal region horizontal, broadly concave; nostril nearer to the end of the snout than to the eye; distance between the nostrils $\frac{2}{3}$ in the distance between the eyes; upper eyelid slightly shorter than the interorbital width; tympanum small, fully developed, $\frac{2}{3}$ the diameter of the eye; distance between the eye and the tympanum $\frac{1}{2}$ the diameter of the latter or $\frac{1}{3}$ the diameter of the former.

Fore limb very short; fingers short, rather slightly swollen at the extremity; first equal to the second; third as long as the arm and fourth not longer than the first or the second; subarticular tubercles feebly developed. The tubercle at the base of the third finger is much larger than that at the base of the first.

Parotoids elongate, moderately prominent, as long as the arm, slightly more than twice its own width.

Hind limb short; the tibio-tarsal articulation not reaching the shoulder, the heels just touch when the limbs are folded at right angles to the body; thigh nearly as long as wide; tibia about $2\frac{2}{3}$ as long as broad and $1\frac{1}{3}$ times longer than the tarsus; toes very short, tips rather obtuse, entirely free; subarticular tubercles not prominent; inner metatarsal tubercle about $\frac{1}{3}$ in the length of the first toe; the outer much smaller situated at the base of the fifth toe.

Upper surface of the skin covered with small uniformly distributed tubercles; with a small row of larger warts on the median line of the back, the first pair being the largest; throat and abdomen with spiny granules which are more prominent on the limbs. A dark temporal line extending to the sides.

Pale brown above, with a network of dark lines, sides lighter with similar marbling; ventral surface dirty white with dark blotches; under-surface of thighs white.

MEASUREMENTS.

	mm.		mm.
Snout to vent ..	.. 27·00	Fore arm ..	.. 7·00
Eye	.. 3·00	First finger ..	.. 3·00
Tympanum ..	.. 2·00	Second finger ..	.. 3·00
Parotoids ..	.. 4·50	Third finger ..	.. 4·50
Width of Parotoids	.. 2·00	Fourth finger ..	.. 3·00

	mm.		mm.
Head	8·00	Thigh	5·00
Width of head	9·00	Width of thigh	
Snout	3·00	Tibia	8·00
Interorbital width ..	3·00	Width of tibia	3·00
Upper eyelid	2·50	Tarsus	6·00
Distance between eye and		Width of tarsus	2·25
tympanum	1·00	Inner metatarsal tubercle ..	1·00
Distance between eye and		Outer metatarsal tubercle ..	
nostril	2·00	First toe	3·00
Distance between eye and		Second toe	4·00
snout	1·00	Third toe	5·75
Distance between nostrils ..	2·00	Fourth toe	8·00
Arm	4·50	Fifth toe	5·00

Habitat.—Kempholey, Hassan District, Mysore State.

A single specimen.

Type.—Central College, Bangalore.

Genus PHILAUTUS.

Dr. Malcolm Smith in describing some specimens of *Philautus* (*Ixalus*) from the Malay Peninsula observes that " it is now generally recognised that the presence or absence of vomerine teeth can no longer be regarded as a character of generic distinction. Although fully accepting this principle, I am not in agreement with those authors who have hastily sunk all the species of *Philautus* under *Rhacophorus*. That some forms of *Philautus* should be placed under *Rhacophorus* is no doubt correct, but the distinctive habit of many other species, suggests that characters will yet be found to retain them apart from *Rhacophorus*. Until a proper revision of the whole group is taken, I prefer to retain the two genera as defined by Boulenger." Now the revision was undertaken by my colleague Mr. L. S. Ramaswami who in reviewing the osteology of the two genera, comes to the conclusion that " after a perusal of the characters enumerated in the résumé (which embraces 21 points) it will be noticed that *Rhacophorus* and *Philautus* agree with each other in seven of the minor features referred to above. It is, therefore, expedient at the present state of our knowledge to treat *Rhacophorus* and *Philautus* as two independent genera." I have myself examined the morphological characters of the several forms of both genera and I have no hesitation in accepting the conclusion of Mr. Ramaswami that *Rhacophorus* and *Philautus* should be treated as separate genera which is in accordance with the suggesrion of Dr. Malcolm Smith. But I am not quite sure if the diagnostic features given by Boulenger of *Philautus* are

adequate and whether they do not overlap with those of *Micrixalus*. Omitting the common features, the only characters in the definition of the two genera, as given by Boulenger, separating them are the presence (*Philautus*) or absence (*Micrixalus*) of an intercalary ossification between the penultimate and distal phalanges and the latter being obtuse in *Philautus* and T-shaped in *Micrixalus*. In other respects the differences do not seem so fundamental as to justify the retention of the two genera as distinct entities and the forms of *Micrixalus* in our collection are too few to suggest the fusion of *Philautus* and *Micrixalus*. If the behaviour patterns of the Batrachians afford an indication, as is assumed by Noble, of phyletic relationships, then nothing can be easier than to bring *Micrixalus* under *Philautus*, for our observations on the breeding habits and on the larval forms of the members of these two genera point to a close agreement. But we know that arguments based on this correspondence may be used as a factor only in emphasising the evidence derived from other sources, but they alone cannot constitute a testimony sufficient to favour the merging of one genus into another. In this paper I retain the generic rank of *Philautus* and *Micrixalus*.

Philautus charius, n. sp.

Vomerine teeth none. Papillæ on the tongue absent.

Snout acutely pointed as long as the diameter of the eye. Canthus rostralis distinct. Loreal region concave; strongly obliquely disposed. Nostrils nearer to the tip of the snout than to the eye. Distance between eye and nostrils equals half the interorbital width. Interorbital space twice as broad as the upper eyelid and broader than the diameter of the eye. Tympanum distinct, about one-third the diameter of the eye, and separated from it by half its own diameter. Internarial width half the interorbital space, equals the distance between the eye and the nostril. Fingers not long; tips provided with discs with a narrow crescentic groove separating the dorsal and ventral portions. First finger smaller than the second, slightly less than half the length of the third. Subarticular tubercles moderately developed.

Hind limbs long, the tibio-tarsal articulation reaches the nostril, the heels touch when the limbs are folded at right angles to the body. Thigh less than half in the total length of the body. Tibia nearly as long as the thigh, and more than three times as long as broad. Metatarsus considerably more than half the length of the tibia. Toes rather short, tips dilated into discs, one-third to half-webbed. Metatarsals united. Subarticular tubercles feebly developed, a very minute inner metatarsal tubercle present. No tarsal fold.

Upper surface of the skin finely granulate, the granules confined to the dark median portion, sides smooth. Granules occur on the upper eyelid and on the dorsal portion of the snout. No dorso-lateral glandular fold. Throat smooth, chest and abdomen finely granulate. A supra temporal fold present.

Upper surface of the snout and sides of the body bright yellow (pale in spirit). A dark hour glass-shaped mark starting between the eyes and covering the hinder half of the eyelid, occupies the back extending nearly to the vent. A conspicuous chevron-shaped dark marking on the vent. Canthus and loreal region and upper jaw dark brown. Lower jaw with white and dark dots and vertical lines. Between the eye and the shoulder a deep black mark, covering the tympanum, the lower border of which bears a white crescentic line. Fore arm banded. Third and fourth fingers bear dark stripes and the upper surface of the discs of these digits having dots. Upper surface of thighs with cross bars, the posterior border bronzed with faint white spots. Tibia with stripes, which are inconspicuous on the metatarsus. Heel bears a dark black spot, from which a dark line runs down to more than half the distance of the last two toes, whose upper surface is striped and the top of the discs of all toes faintly dotted. The throat, belly and undersurface of thighs and arms white.

This specimen of *Philautus* is named after my colleague Mr. B. R. Seshachar who has collected a large number of South Indian Batrachians.

MEASUREMENTS.

	mm.		mm.
From snout to vent	23·00	Width of fore arm	2·00
Diameter of the eye	3·00	First finger	2·25
Upper eyelid	2·00	Second finger	3·00
Interorbital space	4·00	Third finger	5·00
Distance between eye and nostril	2·00	Fourth finger	4·00
Internarial distance	2·00	Thigh	10·50
Tympanum	1·00	Width of thigh	3·50
Distance between eye and tympanum	0·50	Tibium	11·00
Head	8·50	Width of tibium	3·00
Width of head	9·00	Metatarsus	7·00
Snout	3·50	Width of metatarsus	1·75
Arm	4·00	First toe	2·00
Width of arm	1·50	Second toe	3·00
Fore arm	5·00	Third toe	5·00
		Fourth toe	6·50
		Fifth toe	5·00

Locality.—Kottigehar, Kadur.

Type.—Central College, Bangalore.

Philautus elegans, n. sp.

Vomerine teeth none. A small papilla on the anterior portion of the tongue, retracted into the sheath. Head flat, longer than broad. Snout elongate, sharply rounded anteriorly, bevelled, projecting beyond the mouth. Canthus rostralis distinct, strongly angular. Loreal region concave, horizontal. Nostrils nearer to the eye than the snout. Distance between the nostrils slightly more than the interorbital space. Upper eyelid equals or slightly less than the interorbital space. Tympanun distinct, half the diameter of the eye, closely touching it.

First finger slightly shorter than the second, third longer than the snout. Subarticular tubercles fully developed. A shallow groove separates the dorsal and ventral portions of the discs.

Hind limb rather moderately long, the tibio-tarsal articulation reaching the eye. Heels touch each other when the limbs are folded at right angles to the body. Thigh two and a half times as long as broad and less than half the length of the body. Tibium slightly longer than thigh and is just half the length of the body and slightly less than three times its breadth. Metatarsus about three times as long as broad. Toes rather short, end in discs, about less than half-webbed. Outer metatarsals united at the base, bearing an outer fold of skin. Subarticular tubercles feebly developed. A small outer metatarsal tubercle.

Skin with minute wart-like tubercles disposed longitudinally on the back, or perfectly smooth. A supra-temporal fold absent. Dorso-lateral glandular fold, feebly developed, extending from the posterior angle of the eye to the groin. The two are separated by a space nearly $\frac{1}{4}$ in length of the body. Lower parts of the limbs and body smooth. Small glandular swellings behind the jaws and in front of shoulder.

Crimson above. A concave dark streak between the eyelids. Sides of body commencing from behind the eyes black. Tympanum red. Loreal region faintly bronzed. The posterior border of upper jaw white. Lower jaw with a few black dots. Posterior border of the fore arm vermiculated. Posterior limbs with dark bands. Posterior border of thighs with white spots on a black background. The cross bars extend to the metatarsus. Last two toes with dark bands. Upper surface of discs dark. Throat and chest marbled : belly yellow (white in spirit). Thighs pinkish.

This is the prettiest specimen in the collection.

MEASUREMENTS.

	mm.		mm.
From snout to vent ..	23·0	Width of fore arm ..	1·75
Head	9·00	First finger	3·00
Width of head ..	7·00	Second finger	3·50
Diameter of the eye ..	3·00	Third finger	4·75
Upper eyelid	2·00	Fourth finger	3·50
Interorbital space ..	2·50	Thigh	10·00
Snout	3·75	Width of thigh	4·00
Distance between eye and nostril	2·00	Tibium	11·50
Internarial width ..	2·75	Width of tibium	3·00
Tympanum	1·50	Metatarsus	6·00
Distance between tympanum and eye	Nil	Width of metatarsus ..	2·00
		First toe	4·00
		Second toe	5·00
Arm	6·00	Third toe	7·00
Width of the arm ..	1·75	Fourth toe	9·00
Fore arm	6·00	Fifth toe	7·00

Locality.—Kempholey, Hassan.

Type.—Central College, Bangalore.

Philautus kottigeharensis, n. sp.

Vomerine teeth none. Tongue with a papilla, the sac with tumid lips.

Head depressed. Upper surface of the snout deeply concave, bounded by ridges anteriorly and laterally. Tip of snout acutely pointed, broader truncated, and projecting beyond the mouth. Snout longer than the eye. Canthus rostralis prominent and angular. Loreal region concave, oblique, becoming continuous with the suborbital grooves. Nostrils prominent, equidistant between tip of snout and eye. Internarial width equals the diameter of the eye. Interorbital width less than the upper eyelid. Tympanum fairly distinct, about half the diameter of the eye, which it closely touches.

Fingers tipped with large discs, about twice as broad as the penultimate phalangeal segment. First finger slightly longer than the second and the third very slightly longer than the snout. All the fingers are free. Subarticular tubercles feebly developed.

Hind limbs long. Thigh more than twice as long as broad and as long as the tibium. Tibio-tarsal articulation reaches tip of the snout. Metatarsus longer than arm and more than twice as long as broad. Toes rather short, tip ending in discs, web extending to the discs. Outer metatarsals united

at the base or separate. Subarticular tubercles feebly developed; a very minute inner metatarsal tubercle.

Upper surface of body with minute tubercles, a supra-temporal fold and dorso-lateral folds are present. The latter commence well behind the eyes, and are separated from each other by a distance less than 1/5 in the total length of the body. Deep suborbital grooves confluent with the loreal region present. Undersurface of body and thighs smooth.

Uniform deep bronze above and sides of head, body and limbs, hind limbs and fore arms barred by deeper stripes. Discs of fingers and toes dark on both surfaces. Web dark, and the folded toes produce a characteristic deep black colour. Lower jaw and throat bronzed—the dark colour extending sometimes to the chest and the anterior division of the abdomen, or the latter two regions may be bright orange, ventral undersurface of thighs red, the posterior border feebly marbled. Sides of body yellowish or whitish.

MEASUREMENTS.

	mm.		mm.
From snout to vent ..	23·00	Width of fore arm ..	2·00
Head	8·00	First finger	3·00
Width of head	6·00	Second finger	3·50
Snout	4·00	Third finger	4·75
Eye	3·00	Fourth finger	4·00
Upper eyelid	2·00	Thigh	15·00
Interorbital space ..	2·00	Width of thigh	4·50
Tympanum	1·50	Tibium	15·00
Distance between tympanum and eye	Nil	Width of tibium	3·00
		Metatarsus	8·00
Distance between eye and nostril	2·00	Width of metatarsus ..	2·25
		First toe	3·25
Internarial distance ..	3·00	Second toe	5·00
Arm	7·00	Third toe	7·75
Width of arm	2·00	Fourth toe	11·00
Fore arm	5·00	Fifth toe	8·00

Locality.—Kottigehar, Kadur.

Type.—Central College, Bangalore.

Philautus swamianus, n. sp.

Vomerine teeth none. Tongue large, bifid behind, a conical papillæ nearer to the anterior end, retractile sheath an elongated slit.

Head perfectly flat, depressed, snout pointed, projecting beyond the mouth, longer than the eye. Canthus rostralis prominent, angular. Loreal region concave, horizontal, separated from the narrow suborbital or upper

narial groove. Nostrils prominent, about midway between the eye and the tip of the snout. Distance between nostrils very slightly less than inter-orbital space, equals diameter of the eye. Interorbital space wider than the upper eyelid, and exceeds the eye by a narrow margin. Tympanum half hidden, and about half the diameter of the eye from it is separated by a a distance less than its width.

Tips of fingers with discs, nearly twice as broad as the penultimate phalangeal segment. There is no groove separtaing the dorsal and ventral portions of the discs. First finger shorter than the second, the former about the diameter of the eye. The third slightly exceeds the length of the snout. Subarticular tubercles feebly developed on the first and the second fingers and absent from the third and the fourth fingers.

Hind limb fairly long, the tibio-tarsal articulation reaching beyond the eye, heels overlap when the limbs are folded at right angles to the body. Thigh $2\frac{1}{2}$ times as long as broad and tibia about as long as thigh and slightly less than $3\frac{1}{2}$ times its width. Toes rather short, web extending to the discs which are equal to twice the width of the penultimate phalangeal segment. Subarticular tubercles poorly developed. A small inner conical metatarsal tubercle present. Outer metatarsals separated at the base. No tarsal fold. Heels prominent.

Skin smooth above and also below. Supra-temporal fold inconspicuous. Darso-lateral folds occur, starting from behind the eyes and separated from each other by a space equal to the interorbital width. Folds may be interrupted, not quite reaching the groin. In addition there are two fairly well-developed lateral folds, converging towards the vent, beginning from about the middle of the sides of the body. The two sets of folds may become continuous.

Upper surface of the body uniformally bluish, dark bronze in spirit. Loreal region and upper jaw lighter. Thighs and tibia barred. Fore limbs without bands. On the sides of the body, commencing from the eyes, are fine rows, two or three, of white glandular bodies which meet in front of the vent. Throat pale buff, chest marbled, abdomen white. Anterior portion of the ventral surface of thighs pinkish, the posterior vermiculated. Under-surface of tarsus, foot and discs bronzed.

I have named this species after my colleague Mr. L. S. Ramaswami, whose contributions to our knowledge of the cranial morphology of the Anura of South India have been of invaluable assistance to me.

MEASUREMENTS.

	mm.		mm.
From snout to vent	29·00	Width of fore arm	2·00
Head	10·00	First finger	3·00
Width of head	8·00	Second finger	3·50
Eye	3·00	Third finger	5·00
Upper eyelid	2·00	Fourth finger	4·00
Interorbital space	3·50	Thigh	15·00
Distance between eye and nostrils	2·00	Width of the thigh	6·00
Snout	4·00	Tibium	15·00
Internarial space	3·00	Width of tibium	4·50
Tympanum	1·50	Tarsus	6·00
Distance between eye and tympanum	1·00	Width of metatarsus	2·25
Arm	6·00	First toe	3·00
Width of arm	2·00	Second toe	5·00
Fore arm	5·50	Third toe	6·50
		Fourth toe	8·50
		Fifth toe	6·50

Locality.—Kottigehar, Kadur.

Type.—Central College, Bangalore.

Philautus melanensis, n. sp.

No vomerine teeth. Mouth large. Tongue comparatively small, a short conical papillæ on the anterior half of the tongue. Lower jaw with a small anterior median tooth-like prominence, with deep indents on each side.

Head rather large, depressed nearly as broad as long, or only slightly longer. Snout blunt, rounded anteriorly, a little longer than the eye, projecting slightly beyond the mouth. Canthus rostralis prominent, broad angular. Loreal region concave, nearly horizontal or slightly oblique, continuous with the suborbital groove. Diameter of the eye equals the width of the upper eyelid. Interorbital distance greater than the eye. Nostrils nearer the tip of snout than the eye, internarial space about half or only slightly less than half the length of the snout. Tympanum distinct, about two-thirds in the diameter of the eye, which it almost touches or may be separated by a line.

Fingers with discs which are about twice as broad as the penultimate phalangeal segment. A distinct crescentic groove separates the dorsal and ventral parts. First finger shorter than the second and the third twice as

long as the first or twice the diameter of the eye. Fourth finger equals or very slightly longer than the snout. Subarticular tubercles well developed.

Hind limbs rather long, the tibio-tarsal articulation reaching the tip of the snout or beyond. Heels overlap when the limbs are folded at right angles to the body. Thigh less than four times its own width and is shorter than tibium. Tibium more than four times its own width. First three toes free, a rudimentary web at the base of the fourth and fifth toes. Discs as broad as the penultimate phalangeal segment. Subarticular tubercles poorly developed. Outer metatarsals united at the base. An inner metatarsal tubercle in an extremely rudimentary condition. No outer metatarsal tubercle. No tarsal and metatarsal folds.

Upper surface of skin with or without short longitudinal folds covered uniformly with fine white granules. These granules extend to the thighs and sometimes to the tibia. A supra-tympanic fold. Throat, chest, belly and undersurface of limbs and toes covered with large tubercles.

Uniform black above. Anterior limbs black. Thighs and tibia either black or pale yellow with cross bars. Ventral surface of body and thighs yellowish. Undersurface of tibia and foot, black or bronze.

MEASUREMENTS.

	mm.		mm.
From snout to vent	29·00	Width of fore arm	3·00
Head	13·00	First finger	3·00
Width of head	12·00	Second finger	4·00
Eye	3·00	Third finger	6·00
Upper eyelid	3·00	Fourth finger	4·50
Interorbital space	5·00	Thigh	15·00
Distance between eye and nostril	3·50	Width of thigh	4·00
Snout	4·00	Tibium	17·00
Internarial distance	2·50	Width of tibium	4·00
Tympanum	2·00	Tarsus	9·00
Space between eye and tympanum	Nil	Width of tarsus	3·00
Arm	8·00	First toe	3·00
Width of arm	3·00	Second toe	4·50
Fore arm	8·00	Third toe	8·00
		Fourth toe	12·00
		Fifth toe	8·25

Locality.—Kempholey, Hassan.

Type.—Central College, Bangalore.

Philautus narainensis, n. sp.

No vomerine teeth, tongue small, thin, leaf-like with a conical papilla, retractile sheath slit-like. Mouth rather small. Choana broadly separated, situated at the extreme lateral margin.

Head depressed longer than broad, snout acutely pointed, the prenasal region acutely triangular viewed from above. In front, the snout bears pits and grooves, the latter vertically disposed, the tip of snout looking like a prostomeal lobe. Snout projects beyond the mouth, a conspicuous glandular mental pad. Canthus rostralis prominent, ridge-like and angular. Loreal region concave, horizontal, confluent with the anterior rostral pits in front and suborbital groove behind. Upper surface of the internarial region concave, bounded anteriorly by a transverse bar of the prostomial lobe; eye $1\frac{1}{2}$ times the upper eyelid which equals the interorbital space. Snout longer than the eye and the nostrils about midway between the eye and tip of the snout. Internarial space wider than the interorbital width and equals the diameter of the eye. Tympanum moderately distinct, about $\frac{1}{2}$ the diameter of the eye from which it is narrowly separated.

Fingers rather short with discs which are small on the first and the second, larger on the fourth which is twice as wide as the penultimate phalangeal segment. First finger shorter than the second. The fourth finger a little longer than the eye. A single subarticular tubercle on the first finger, others nearly free. Grooves of the discs not clear.

Hind limb rather long, the tibio-tarsal articulation reaching beyond the tip of the snout. Heels overlap when the limbs are folded at right angles to the axis of the body. Thigh more than three times as long as wide, tibia longer than the thigh and about 5 times as long as broad. Toes rather short, discs small. Web extending upto the discs of first two toes, but stops at the base of the penultimate phalangeal bone of the fourth toe, and at the base of the phalangeal bone of the third and the fifth. Outer metatarsal free at base. Subarticular tubercle feebly developed. No inner or outer metatarsal tubercle. Heel not marked, no dermal appendage. No tarsal and metatarsal folds.

Skin smooth above and below. No supra-temporal fold. The place of dorso-lateral folds is taken by two short folds commencing from behind the eyes, terminate on the back, a little behind the shoulder, about $1\frac{1}{2}$ times as long as the snout, and separated from each other by a space equal to the interorbital width.

Brownish red above including the limbs. The anterior border of the thighs and the upper part of tibia very feebly banded. The posterior border of thighs and the inner border of tibia feebly vermiculated. Throat

and chest buff coloured. Belly dirty white. Lower surface of thighs and the tibia whitish.

This species is named after my colleague Mr. A. Narayana Rao, who has added considerably to our batrachian collection.

MEASUREMENTS.

	mm.		mm.
From snout to vent	29·00	Width of fore arm	2·00
Head	10·00	First finger	2·00
Width of head	7·50	Second finger	3·25
Diameter of the eye	3·00	Third finger (Injured in both arms)	
Upper eyelid	2·00	Fourth finger	3·50
Interorbital space	2·00	Thigh	13·00
Snout	4·00	Width of thigh	4·00
Distance between eye and nostril	2·00	Tibium	15·00
Internarial space	3·00	Width of tibium	3·00
Tympanum	1·50	Tarsus	6·25
Distance between tympanum and eye	0·50	Width of tarsus	2·00
Arm	7·00	First toe	3·00
Width of arm	2·00	Second toe	5·00
Fore arm	5·00	Third toe	8·00
		Fourth toe	10·75
		Fifth toe	8·00

Locality.—Kottigehar, Kadur.

Type.—Central College, Bangalore.

Philautus longicrus, n. sp.

Vomerine teeth none. Tongue without papilla. Choana laterally situated.

Head moderately depressed, as long as broad. Snout obtusely pointed, a little longer than the eye, scarcely projecting beyond the mouth. Canthus rostralis prominent. Loreal region slightly concave and horizontal. Nostrils midway between the eye and the tip of the snout. Distance between the nostrils equals the diameter of the eye or the interorbital space. Upper eyelid about $\frac{2}{3}$ in the interorbital space. Tympanum distinct, about half the diameter of the eye, being separated from it very narrowly.

Fingers moderately developed. Discs not broad, slightly wider than the terminal phalangeal segment. First finger shorter than the second. Subarticular tubercles fairly well developed. Length of arm equals the length of the snout.

Hind limb very long. The tibio-tarsal articulation reaching far beyond the tip of the snout. Heels strongly overlap when the limbs are folded at right angles to the body. Tibium more than four times as long as broad and is longer than the thigh. Tips of toes dilated into discs, half-webbed.

Outer metatarsals united at the base. A minute elongate inner metatarsal tubercle. Subarticular tubercles fairly well-developed. A faint outer metatarsal fold. No tarsal fold.

Upper surface of the skin with faint folds. Sides with short glandular folds, serially arranged. Minute tubercles occurring between the series. Ventral surface of body and thighs smooth. Upper surface of snout pale grey—a dark band between the nostril and eye over canthus rostralis. Loreal and suborbital region yellow, extending as far behind as the angles of the mouth. A brown mark over the supra-tympanic fold. Tympanum reddish. Upper and lower jaw with dark vertical bands, the upper series terminating just below the middle of the eye. Interorbital space with a faint transverse band. Upper surface of body olive brown. Thighs with cross bars on the anterior border, the posterior border minutely marbled. Tibium also barred anteriorly, but whitish posteriorly. A dark line stretching from heel to foot. Lower surface of the body and thighs white.

MEASUREMENTS.

	mm.		mm.
From snout to vent	20·00	Width of fore arm	2·00
Head	8·50	First finger	2·75
Width of head	8·50	Second finger	3·00
Snout	4·00	Third finger	3·75
Eye	3·00	Fourth finger	2·50
Upper eyelid	2·00	Thigh	10·00
Interorbital space	3·00	Width of thigh	4·00
Distance between eye and nostril	2·00	Tibium	13·00
Internarial distance	3·00	Width of tibium	3·00
Tympanum	1·50	Tarsus	6·25
Distance between tympanum and eye	0·75	Width of tarsus	2·00
Arm	4·00	First toe	2·00
Width of arm	2·00	Second toe	4·00
Fore arm	5·00	Third toe	6·00
		Fourth toe	10·00
		Fifth toe	5·50

Locality.—Kempholey, Hassan.

Type.—Central College, Bangalore.

Philautus montanus, n. sp.

Vomerine teeth absent. Tongue with a short papilla situated rather anteriorily and in the spirit specimen retracted into a pit, strongly bifid.

Head depressed as long as broad. Snout rounded, broadly truncate, not projecting beyond the mouth. Snout longer than the eye. Canthus rostralis vertical, loreal region concave and horizontal. Nostrils nearer to

the tip of snout than to eye. Internarial distance equals the space between the eye and the nostrils. Diameter of the eye equals the interorbital width and is more than twice the tympanum. Upper eyelid less than interorbital space. Tympanum not prominent, about half the diameter of the eye from which it is separated by a narrow space.

Fingers moderately long, tips provided with discs bearing the groove separating the upper from the lower portion. No web. Discs small, smaller than the tympanum. First finger shorter than the second. Third finger longer than the snout. Subarticular tubercles moderately developed.

Hind limb long; the tibio-tarsal articulation reaching the eye. Heels do not overlap when the limbs are folded at right angles to the body. Thigh more than three times its width; tibium as long as the thigh and more than four times its own width. Metatarsus equals or slightly longer than the third or fifth toe. Toes not long, about two-thirds webbed. Discs smaller than those of the fingers. A small oval inner metatarsal tubercle present. Base of toes united, outer metatarsal without a fold. No outer metatarsal tubercle. Subarticular tubercles moderately developed.

Skin smooth above. Throat, chest and abdomen and undersurface of the arms and hand finely granulate. A feebly developed supra tympanic fold present. A faintly V-shaped fold of skin on the occiput, commencing from the middle of the eyelids. No dorso-lateral fold.

Bright red above in the living condition, brownish red in spirit, with or without white spots on the body. Throat and upper part of chest brownish, speckled with white. Rest of the ventral surface yellowish, the dark bands meeting on the anterior border of thighs give rise to ocellus-like spots when viewed ventrally. A brown band between the eye-lids, faint in spirit. Thighs barred, a single broad band on the shank. Undersurface of hind limbs yellow with brown marbling.

MEASUREMENTS.

	mm.		mm.
From snout to vent	37·00	Width of arm	3·00
Head	14·00	Width of fore arm	2·75
Width of head	14·00	First finger	3·25
Internarial distance	3·00	Second finger	4·50
Distance between eye and nostril	3·00	Third finger	7·50
Eye	5·00	Fourth finger	6·25
Nostril	6·00	Thigh	17·00
Interorbital width	5·00	Width of thigh	5·00
Upper eyelid	3·00	Shank	17·00
		Width of shank	4·00

	mm.		mm.
Tympanum	2·50	First toe	3·50
Distance between tympanum and eye	1·00	Second toe	5·00
		Third toe	9·00
Arm	6·00	Fourth toe	12·00
Fore arm	8·00	Fifth toe	9·00

Locality.—Hills of Kempholey, Hassan.

Type.—Central College, Bangalore.

Family MICROHYLIDAE.

Ramanella minor, n. sp.

Post-narial ridges strongly developed, obliquely set, meeting dorsally, with an extremely narrow ventral cleft. Anterior pharyngeal fold inconspicuous. Snout short, broadly truncated. Distance between nostrils equals width of the upper eyelid. Inrerorbital space nearly twice the width of the upper eyelid. Diameter of the eye less than the length of the snout. Canthus rostalis obtuse. Loreal region almost vertical. Distance between eye and nostril equals the diameter of the eye.

Tibio-tarsal articulation touches middle of the body. Toes entirely free, tips almost pointed. Subarticular tubercles well-developed. Inner metatarsal tubercle conical, moderately developed. Outer metatarsal tubercle rounded, inconspicuous. When the hind limbs are folded at right angles to the body, the heels touch.

Fingers with triangular dilations, nearly twice as broad as the penultimate joint.

Skin smooth above, slightly pustular on the sides. A fold from the posterior angle of the eye to the shoulder. No occipital fold. Lower surface smooth.

Upper surface of snout olive, with a median dark band, short not reaching the interorbital space. Sides of the snout dark which is continuous with the dark on the sides and ventral surface of the body. A dark spot between the eyes on the upper surface of the head. A dark broad band on the dorsum, flanked by olive bands. The latter do not extend to the sides of the body. The former stops at the coccyx, which is olive mottled with dark irregular markings. The anterior and posterior limbs entirely black. The ventral surface including the throat black. The abdominal region and thighs bearing white spots.

MEASUREMENTS.

Length.—25 mm.

	mm.		mm.
Diameter of the eye ..	2·00	Third toe	6·50
Length of snout	2·75	Fourth toe	9·00
Distance between the nostrils	1·50	Fifth toe	6·00
Interorbital width ..		Thigh across the anterior border	7·00
Distance between eye and nostril	2·00	Thigh across the anterior border ventrally ..	9·00
First toe	2·00	Shank	9·75
Second toe	4·00	Tarsus	5·50

Locality.—Saklespur, Hassan.

Type.—Central College, Bangalore.

Ramanella triangularis rufeventris, n. var.

In the plantain gardens behind the houses in Saklespur, there is a small variety of R. *triangularis*, occurring fairly in large numbers. These are found in the whorls of the leaf stalks, and are mostly solitary. This variety possesses the power of climbing smooth surfaces like *R. variegata.*

This variety differs from the *R. triangularis* in two characteristics.

1. The snout is pointed, tips obliquely truncated, prominent.
2. Tibio-tarsal articulation stands well behind the shoulder.

In regard to colour, almost every specimen in the collection bears an occipital dark band continuous at the sides with the tympanoloreal band. This cross band may or may not be continuous with the dorso-median band. Even in the spirit specimens, the lower surface is reddish (in the living state, the red is bright and warm) which extends over the undersurface of the anterior and posterior limbs. The ventral white spots are confined to the abdomen and the lower surface of thighs. A short dark streak on the rostrum is always present. The olive is replaced in this variety by grey. Limbs barred with dark red.

Ramanella triangularis of the plains is not met with in the Malnad areas and it is represented by this local variety which may be designated *Ramanella triangularis rufuventris.*

Length 22 mm. Specimens, Central College, Bangalore.

Locality.—Mudigere, Kadur, Saklespur, Hassan.

Ramanella mormorata, n. sp.

Post-choanal ridges transversely disposed, well developed; a broad median gap between the two ridges. The anterior pharyngeal ridge strongly arched, the limbs dilated into thick lateral swellings. The fimbriæ of the posterior pharyngeal ridges not conspicuous. Snout short, truncated, not prominent, as long as the diameter of the eye. Canthus rostralis rounded. Loreal region oblique. Rostralis rounded. Inter-orbital space much broader than the upper eyelid which equals the internarial distance.

Fingers with wide triangular dilations, which are twice as large as the penultimate joints.

Toes ending obtusely, with a suspicion of a web at the base; sub-articular tubercles moderately developed. Inner metatarsal tubercle shovel shaped. Outer metatarsal tubercle well developed, conical, situated at the base of the fifth toe. Tibio-tarsal articulation does not reach the shoulder, but stands well behind the axilla. Heels stand apart when the hind limbs are flexed behind at right angles to the body. Skin on the upper surface is warty in the young specimens, tubercles becoming confined to the posterior half of the body, sometimes extending to the dorsal surface of the hind limbs in the mature forms. Lower surface perfectly smooth. Supra tympanic fold inconspicuous. No occipital fold.

Immature specimens pale olive or pale reddish brown above. Mature males bright reddish brown above; mature females deep olive above. A dark broad band between the eyes, sometimes involving the lids. Snout bearing a triangular or V-shaped dark mark. A broad angular dark band between the shoulders. Behind this region, dark spots or irregular markings invariably occur which may sometimes extend to the sides. No lateral dark bands on the body. Loreal region free. Limbs bright yellow or deep olive green according to the sex. The posterior border of the arm bears a dark band. Fore arm, hand, fingers, thigh, shank, tarsus, foot and toes barred. The crural band usually extending into the groin, may be reduced to a spot continuous with the prevailing colour of the upper surface. Lower surface including the throat and the limbs beautifully marked in the male with yellow and reddish brown and in the female with dark blue and moss green.

MEASUREMENTS.

	mm.		mm.
Diameter of the eye ..	3·00	Thigh	7·00
Distance between eye and nostril	2·75	Width of thigh	5·00
Snout	3·00	Shank	9·00
		Width of shank	3·00

Internarial distance ..	2·00	Tarsus	4·00
Interorbital space ..	3·75	Width of tarsus	2·00
Upper eyelid	2·00	Width of foot	3·00
Upper arm	4·00	First toe	2·00
Fore arm	6·00	Second toe	4·25
First finger	2·50	Third toe	6·00
Second finger	3·00	Fourth toe	8·50
Third finger	5·00	Fifth toe	6·00
Fourth finger	4·25	Total length	25·00

Locality.—Saklespur, Hassan District, Mysore.

Type.—Central College, Bangalore.

Remarks.—The specimens were found in the whorls of the plantain leaves. They usually occur solitary. Occasionally two or three specimens may be found together in the same cramped space.

Ramanella anamalaiensis, n. sp.

Post-narial ridges incompletely developed, that on the right-side is absent. Post-pharyngeal ridge fimbriated. Snout broadly triangular, truncated. Head depressed. Diameter of the eye greater than the length of the snout. Interorbital space twice the width of the upper eyelid. Distance between the eye and nostril equals width of upper eyelid. Internarial distance slightly more than half the length of the snout. Canthus rostralis rounded. Loreal region oblique. Supra-tympanic fold present. No occipital fold. Tips of fingers truncated, not discoidal, about the same width as the penultimate joints. Fore arm slightly longer than the third finger and twice as long as the first. Toes perfectly free, ending obtudely. Thigh slightly shorter than the third toe, shank shorter than the fourth toe. Shank more than twice as long as wide. Inner metatarsal tubercle moderately developed, shovel shaped. Outer obtusely conical placed between the bases of the fourth and fifth toes. Sub-articular tubercles moderately developed. Tibio-tarsal articulation reaches the shoulder. Heels do not touch when the legs are folded behind the vent at right angles to the body.

Upper surface of the skin warty. Lower surface smooth. Bright olive above with a broad dark median band commencing from behind the occipital region and extending upto the coccygeal region ; behind this band a few irregularly shaped black-markings. Bewteen the eyes a squarish dark mark and on each upper eyelid a dark spot. Upper surface of the snout olive. Loreal region and sides of body reddish brown. Upper surface of arms olive blotched with brown. Fore arm reddish brown. Upper surface of thighs and shanks reddish brown, throat and abdomen and lower surface

of limbs pale brown. A few indistinct white spots on the belly. Hand and foot brown.

MEASUREMENTS.

	mm.		mm.
Diameter of the eye ..	4·00	Shank : Length	9·50
Snout	3·00	Width	4·00
Interorbital space ..	4·25	Tarsus : Length	6·00
Upper eyelid	2·00	Width	3·00
Distance between nostrils ..	1·75	First toe	2·00
Distance between eye and nostril	2·00	Second toe	4·50
Arm	6·00	Third toe	7·75
Fore arm	8·00	Fourth toe	11·0
First finger	4·00	Fifth toe	6·50
Second finger	5·00	Broadest part of the foot (between 2nd and 5th toes)	4·00
Third finger	7·50	Total length	28·00
Fourth finger	5·50		
Thigh : Length	7·25		
Width	5·50		

Locality.—Base of Anamalai Hills, Coimbatore District.

Type.—Central College, Bangalore.

TADPOLES.

Philautus leucorhincus.

These tadpoles are small. Head and body rather narrowly oval. Upper surface convex, ventral rather flat. The snout is rounded and slopes down. Diameter of the mouth smaller than the convex interorbital space, which is as wide as the internasal breadth. Nostrils nearer to the eyes than to the tip of snout. Eyes and nostrils dorso-lateral. Spiracular tube short, not prominent. Spiracular orifice directed upwards and backwards nearer to the eye than to the root of the hind limbs. Mouth disc provided with upper and lower lips. The latter is notched in the middle. Both lips and lateral lobate borders fringed with papillæ. The upper beak with a smooth border, the lower with a serrated margin. No teeth. The tail is long. The upper fin commences far beyond the root of the tail, and is stringly arched. The ventral fin commences well behind the dorsal and has a straight border. The dorsal fin is deeper. Tip of tail pointed. The limbless forms have an yellow dorso-median area, which in the preorbital region becomes white which is characteristic mark of the adult. Sometimes a brown dorsal band. Sides and belly blackish. Throat whitish, muscular part of the tail yellowish with black marks. In the four-legged forms, the colour becomes uniformly

rufous, the snout remaining whitish. The dark dorsal band becomes more marked. Anal tube dextral.

MEASUREMENTS.

	mm.		mm.
Total length	26·00	Breadth of body ..	5·50
Length of head and body ..	9·00	Depth of body	4·00
Length of tail	17·00	Depth of tail	3·75

Locality.—Streams of Kempholey, Hassan.

Philautus hypomelas.

These tadpoles have an elongated body, and are not large. The head and body are elliptical. Snout broadly rounded, mouth ventral. Hind end of body more or less tapering. Both surfaces of body convex. Mouth small, shorter than the interorbital space. Internasal width slightly greater than the interorbital breadth. Eyes and nostrils dorso-lateral. Spiracle broad at the base, directed upwards, orifice dorso-lateral, nearer to the eye than to the root of the hind limb. Mouth disc small, provided with well-developed upper and lower lips. The latter multilobed. The lower lip and the lobate sides are free from papillæ which occur only on the upper lip. The inner border of the lower lip with a crenulate edge. The upper beak is smooth, the lower serrated. No teeth. The tail is well developed. The upper fin begins well behind the root of the tail. Both fins are of equal depth and are broadly curved. Tip of tail pointed. Skin smooth. Upper surface of the body purplish or reddish brown. Preorbital region of the head transparent. Throat whitish. Belly black. Muscular part of tail reddish, with black markings. Fins grey. Anal tube dextral.

MEASUREMENTS.

	mm.		mm.
Total length	32·00	Breadth of Body	8·00
Length of head and body	10·00	Depth of body	5·00
Length of tail	22·00	Depth of tail	6·50

Locality.—Streams of Kempholey, Hassan.

Philautus nassutus.

The tadpoles are not large. The head and body rather elongated and narrowly oval. Both surfaces are convex. The snout is rounded, slopes downwards. Dorso-median line grooved in some cases. Mouth small, shorter than the interorbital space which equals the internasal width. Eyes and nostrils dorso-lateral. Latter nearer to the eyes than the tip of the snout. Spiracle tubular, lateral pointing backwards. Spiracular opening nearer to eyes than the root of the hind limbs. The mouth disc is

small. Both lips well developed. Upper fringed with papillæ. Sides lobate, borders with more than one row of papillæ. Lower lip provided with three lobes, covered with numerous papillæ. Upper beak broadly V-shaped with a serrated border. No teeth. The tail is long and powerfully developed. The dorsal and ventral fins attain maximum depth in the posterior half of the tail. The muscular portion broader. The dorsal fin does not extend beyond the root of tail. Tail pointed. Anal tube dextral. Skin smooth. Upper surface bright yellow, with dark irregularly distributed dots. The muscular part of tail yellow with clusters of black spots, sometimes running together to form bands. Under surface of body white. Caudal fins grey.

MEASUREMENTS.

	mm.		mm.
Total length	32·00	Greatest width of body ..	11·00
Length of head and body	12·00	Greatest depth of body ..	9·00
Length of Tail	21·00	Greatest depth of tail ..	8·00

Locality.—Streams of Kempholey, Hassan.

Philautus pulcher.

The tadpoles are comparatively small. Head and body narrowly oval, moderately flattened above and below. In a few cases the upper surface is convex. The snout is rounded, sloping downwards. Diameter of the mouth about $\frac{3}{4}$ in the interorbital width, which is broader than the interorbital space. Eyes dorso-lateral. Nostrils point upwards, nearer to the eyes than to the tip of snout. Spiracle distinctly tubular, directed upwards. Spiracular orifice nearer to the eye than to the root of the hind limb. The mouth disc is small. Upper lip not developed, but bears a lobe provided with a double row of papillate border. Sides lobate, lower lip multilobed, both bearing minute papillæ. The upper beak broadly crescentic with a smooth border, lower serrated. Tail strongly developed. Upper fin commences well behind the root of the tail, both fins are well developed and are of the same depth. The upper broadly arched, the lower being nearly straight. Tip of tail pointed. Skin smooth. Upper surface of head and body slate coloured. Undersurface grey. Muscular part of tail yellow, with black markings, running into longitudinal or vertical streaks. Latter marking prominent in the hinder half of the tail. Anal tube median.

MEASUREMENTS.

	mm.		mm.
Total length ..	27·00	Width of body	5·00
Length of head and body	9·00	Depth of body	4·00
Length of tail ..	18·00	Depth of tail	4·00

Locality.—Streams of Kempholey, Hassan.

Philautus variabilis.

The tadpoles are of moderately large size, the head and body being oval. Dorsal surface slightly flat, ventral distinctly convex. The snout is rounded, sloping down. Mouth ventral. Nostrils nearer to the tip of the snout, internasal space almost equal to interorbital width, eyes dorso-lateral, nostrils point upwards. Eyes nearer to the tip of the snout than to the spiracular opening. The spiracle is lateral, sinistral, orifice directed upwards and backwards. Mouth disc small, surrounded by broad lobes fringed with rows of papillæ. The upper lip has two rows of papillæ. The lower lip is divided into four lobes, the hinder border bearing small papillæ. The upper beak is broadly U-shaped and the lower V-shaped, having a serrated margin. Dentral rows absent. The tail is well developed. The upper lobe does not extend beyond the roof of the tail. The upper fin is deeper than the lower, but less deep than the muscular part. Tip of tail pointed. Skin smooth, dorsal surface yellowish, with numerous dark dots. The muscular part of tail yellow with dark irregular blotches. Sometimes the inferior border of the lower fin, may bear fine black dots, confined to the posterior division. No preorbital and frontal glands. No sensory pits.

MEASUREMENTS.

	mm.		mm.
Total length	40·00	Breadth of body ..	8·00
Length of head and body	13·00	Depth of body	6·50
Length of tail	27·00	Depth of tail	5·00

Locality.—Streams of Kempholey, Hassan.

Rana aurantiaca.

These tadpoles by their uniform brown colour are apt to be mistaken for those of *Bufo*, and it is interesting that the larvæ of *Rana aurantiaca* the adult of which is beautifully coloured, are so drab. The size of these tadpoles, their oral and caudal characters, distinguish them at once from the larvæ of *Bufo*.

The tadpoles are of moderate size. Head and body oval, not flattend dorso-ventrally, both surfaces being convex. Snout rounded, mouth small, ventral. Eyes dorsal or dorso-lateral. Nostrils pointing laterally. Width of mouth equals or less than the interorbital width which is broader than the internarial spaces. Nostrils equidistant between tip of snout and eyes. Spiracle lateral, sinistral, somewhat broadly tubular, pointing slightly upwards. The mouth disc is small, lower lip better developed. The upper free from papillæ which occur on the sides and on the outer borders of the

lower lip, with a distinct median space free from papillæ. The upper beak is broadly crescentic with a smooth border, the lower is broadly V-shaped, finely serrated. Dental formula $\frac{1}{2}$. The tail is broad. The dorsal fin extends beyond the root of the tail. Both fins are almost equal, but slightly deeper than the muscular portion. Pointed at the tip. Anal tube slightly dextral. Both surfaces of the body and the muscular portion of the tail uniformly brown. Tail fins lightly coloured.

MEASUREMENTS.

	mm.		mm.
Total length ..	31·00	Greatest width of body ..	5·75
Length of head and body	12·00	Greatest depth of body ..	5·75
Length of tail	19·00	Greatest depth of tail ..	7·50

The tadpoles live near the water margins on the tanks at the base of hills and occur in small numbers. Mostly they rest on the floor.

Locality.—Base of Anamalai Hills, Coimbatore District.

Bufo brevirostris.

Generally speaking, the tadpoles of the genus *Bufo* are comparatively small and those of *B. brevirostris* are extremely so. These were taken from rain water puddles from which the adults were obtained. Besides these tadpoles those of *B. melanostictus* and *B. microtympanum* also were collected from the same situation. It is interesting to note that the shoals of tadpoles belonging to the different species keep together separately and it is this distinctive feature of their habits that led to their examination. Like the other members of the genus, the body is obcordate the greater width being at the pectoral region. The snout slopes and is rounded. The diameter of the mouth equals or is greater than the interorbital space. The eyes and nostrils are distinctly dorsal, looking upwards. Interorbital width (1·5 mm.) is greater than the internasal space (1·0 mm.), the nostrils nearer to the eyes than to the tip of the snout. Upper lip devoid of papillæ which fringe the sides and the outer borders of the lower lip. Both lips are equally developed. Dental formula $1 : \frac{1}{3}$. The second series in the upper lip is interrupted in the middle, the three lower series are continuous almost equal to one another. The jaws are finely serrated. Skin smooth. A pair of preorbital glands present. Sensory pits on the back absent. A frontal gland is prominent. Spiracular tube opens slightly dorsalward situated about the middle of the body, not visible from below. Length of tail about $3\frac{1}{2}$ times its total length. Both fins are poorly developed, the dorsal being slightly arched.

Tips of tail pointed. The colour of the dorsal surface is brownish. Undersurface uniformly whitish. Fins of tail grey.

MEASUREMENTS.

	mm.		mm.
Total length	13·00	Maximum breadth of body	3·75
Length of head and body..	6·00	Maximum depth of body ..	2·75
Length of tail	7·00	Maximum depth of tail ..	2·00

The tadpoles of this species of *Bufo* can be easily recognised from the other described forms by the oral papillæ and serrated jaws.

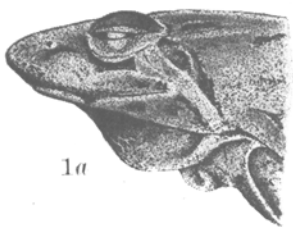
EXPLANATION OF FIGURES.

FIG. 1. *Rana parambikulamana*, actual size.
FIG. 1*a*. Side view of head × 2.
FIG. 1*b*. Undersurface of hand × 2.
FIG. 2. *Rana lucorhyncus* × 2.
FIG. 2*a*. Side view of head × 2.
FIG. 3. *Rana intermedius* × 1½.
FIG. 3*a*. Side view of head × 1½.
FIG. 4. *Rana sauriceps* × 2.
FIG. 4*a*. Side view of head × 2.
FIG. 4*b*. Undersurface of hand × 3.
FIG. 4*c*. Foot × 3.
FIG. 5. *Rana tenuilingua* × 3.
FIG. 5*a*. Side view of head × 3.
FIG. 6. *Nyctibatrachus sylvaticus* × 1½.
FIG. 6*a*. Side view of head × 1½.
FIG. 7. *Nannobatrachus kempholeyensis* × 3.
FIG. 7*a*. Side view of head × 3.
FIG. 8. *Bufo brevirostris* × 2.
FIG. 8*a*. Side view of head × 2.
FIG. 9. *Philautus charius* × 2.
FIG. 9*a*. Side view of head.
FIG. 10. *Philautus elegans* × 3.
FIG. 11. *Philautus kottigeharensis* × 2.
FIG. 11*a*. Side view of head × 3.
FIG. 12. *Philautus swamianus* × 2.
FIG. 12*a*. Side view of head × 4.
FIG. 13. *Philautus melanensis* × 2.
FIG. 13*a*. Side view of head × 2.
FIG. 14. *Philautus narainensis* × 2.
FIG. 14*a*. Side view of head × 3.

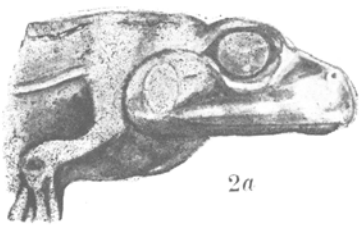
1

2

1b



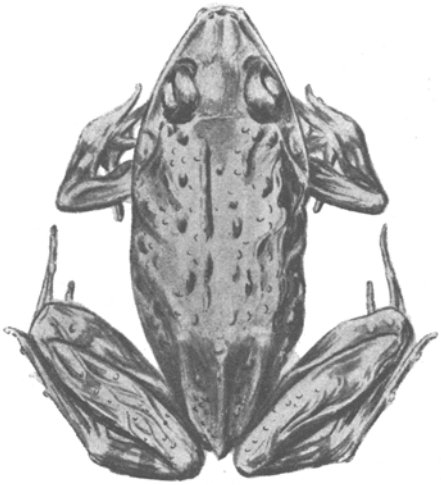
1a



2a

3

3a



4

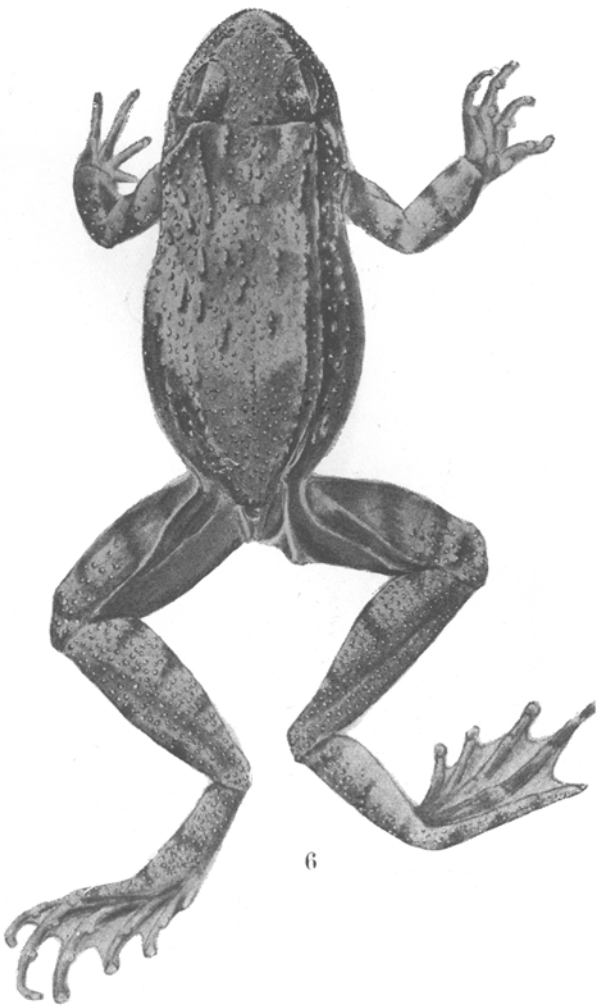
4a

4b

4c

5

5a



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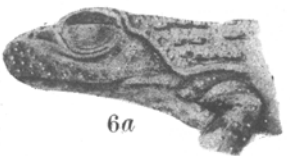
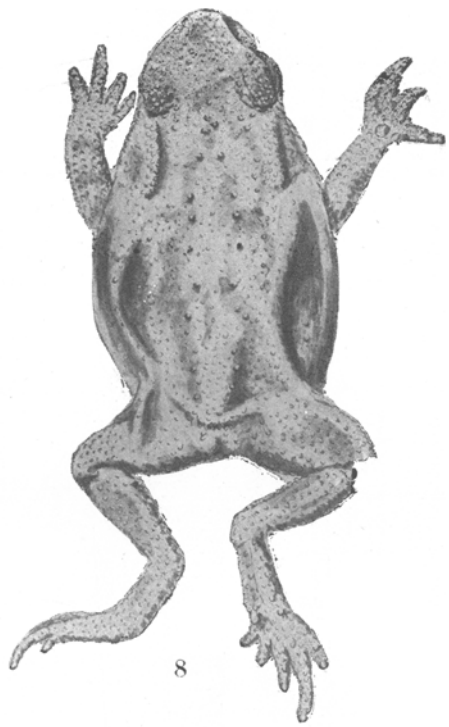


6a

7



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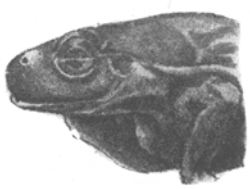


7*a*

8*a*

9

9a

10

11

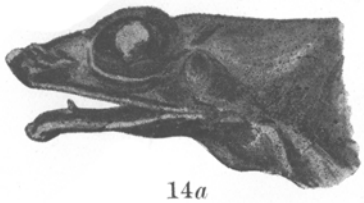
11a

12

12*a*

13

13*a*



14*a*

14

15

15*a*

16

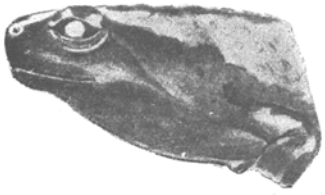
16*a*

17

17*a*

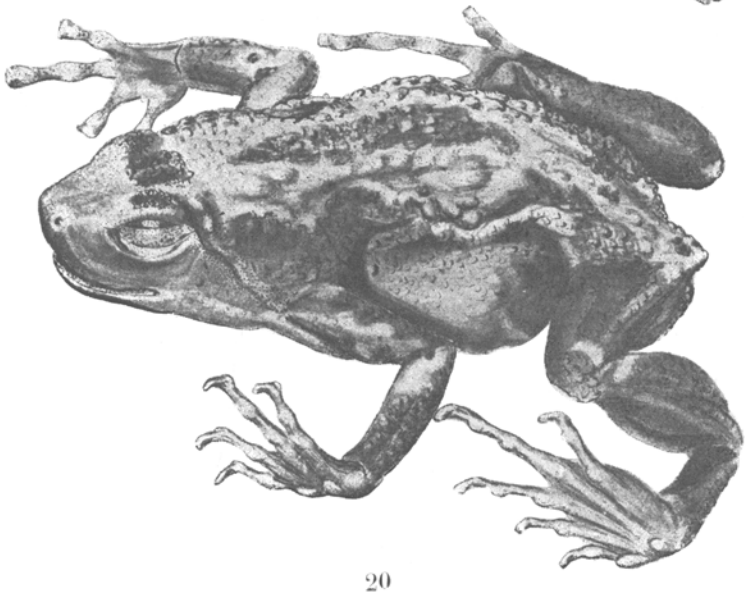
18

19



18*a*

19*a*



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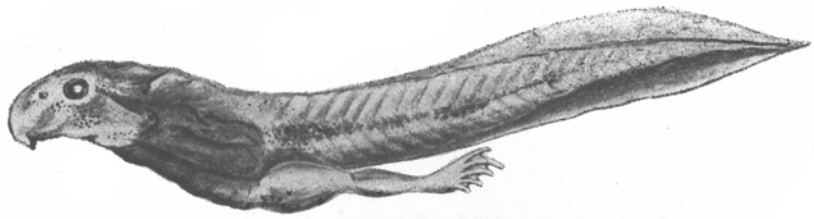


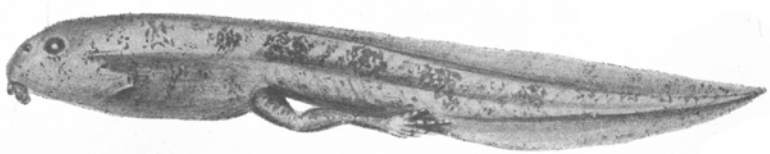
21

21*a*

22*a*

22

23*a*



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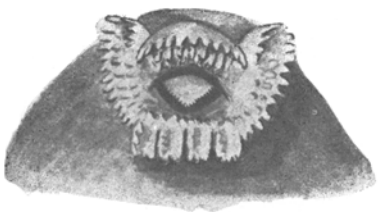
24

24*a*

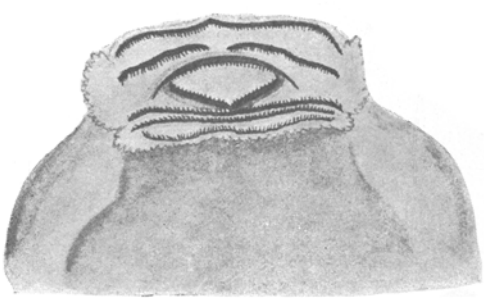


25a

25

26a

26



27a

27

FIG. 15. *Philautus longicrus* × 2.
FIG. 15*a*. Side view of head × 3.
FIG. 16. *Philautus montanus* × 1½.
FIG. 16*a*. Side view of head × 2.
FIG. 17. *Ramanella minor* × 3.
FIG. 17*a*. Side view of head × 3.
FIG. 18. *Ramanella triangularis rufiventris* × 2.
FIG. 18*a*. Side view of head × 3.
FIG. 19. *Ramanella mormorata* × 2.
FIG. 19*a*. Side view of head × 3.
FIG. 20. *Ramanella anamalaiensis* × 3.

TADPOLES.

FIG. 21. *Philautus leucorhyncus* × 3.
FIG. 21*a*. Mouth disc × 5.
FIG. 22. *Philautus hypomelas* × 3.
FIG. 22*a*. Mouth disc × 10.
FIG. 23. *Philautus nassutus* × 3.
FIG. 23*a*. Mouth disc × 10.
FIG. 24. *Philautus pulcher* × 3.
FIG. 24*a*. Mouth disc × 5.
FIG. 25. *Philautus variabilis* × 2.
FIG. 25*a*. Mouth disc × 10.
FIG. 26. *Rana aurantiaca* × 3.
FIG. 26*a*. Mouth disc × 10.
FIG. 27. *Bufo brevirostris* × 5.
FIG. 27*a*. Mouth disc × 15.